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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/270,780	03/17/1999	IKUO HIYAMA	503.36984X00	2934

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EXAMINER

QI, ZHI QIANG

ART UNIT

PAPER NUMBER

2871

DATE MAILED: 05/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/270,780

Applicant(s)

HIYAMA ET AL. *He*

Examiner

Mike Qi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 April 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-18 and 20-34 is/are rejected.
- 7) ☒ Claim(s) 11 and 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☒ Interview Summary (PTO-413) Paper No(s) 14
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 4, 23, 27, 31 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 4, 23, 27 and 31, recitation “the polarized light transmission axis of the reflective polarizer is approximately perpendicularly to a light control axis of the light control element” is indefinite and unclear as a light control axis of the light control element in which the axis can not be a control axis. For examination purpose, it is interpreted as the polarized light transmission axis of the reflective polarizer is approximately perpendicularly to the optical axis of the light control element.

Claim 12 does not indicate any specific arrangement for the liquid crystal layer, the reflective polarizer layer, the absorption type polarizers and the reflective color selective layer, and how to achieve the broaden viewing angle, e.g., a stripe direction of reflective color selective layer is the same as a stripe direction of stripe shaped rod lens array, etc. The claimed language only states a list of elements are arranged, but it does not describe the specific arrangement how to achieve the effect of the widen viewing angle.

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3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 25-26, 29-30 and 33-34 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 25, 29 and 33, concerning "a ratio of a length of the pixel in the major axis direction to a length of the pixel in the minor axis direction is substantially 3:1", it was not described in the specification and where can be found the ratio in a corresponding figures and what is the function to arrange such pixel length ratio 3:1. page 39
lines 2-5

Claims 26, 30 and 34, concerning "the stripes on the reflector are substantially parallel to a major axis direction of a pixel of the liquid crystal display element", it was not described in the specification and where can be found that the stripes on the reflector are parallel to a major axis direction of a pixel in a corresponding figures and what is the function to arrange such stripes parallel to a major axis direction of a pixel. In the specification (page 53), it describes that the stripe shaped grooves of the waveguide (53) (could be the stripes on the reflector 54) is arranged with the direction of the polarized light transmission axis of the reflective polarizer (30).

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Claim Rejections - 35 U.S.C. § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-7, 10, 13-14, 17-18, 20, 22-24, 27-28 and 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant admitted prior art in view of US 5,587,816 (Gunjima et al).

Claims 1, 13 and 20, the Applicant admitted prior art (the “background of the invention” paragraph in the specification, especially in Figs. 32 and 35) discloses a structure of a liquid crystal display device comprising:

(concerning claim 1)

- an illumination device (51,53,54);
 - a light control element (40) arranged at a projected light side of the illumination device;
 - a reflective polarizer (30) arranged at an upper portion of the light control element (40),
- so that the polarized light transmission axis of the reflective polarizer is adjusted so as to increase the transmission rate of the projected light from the illumination device (51,53,54);

(concerning claims 13 and 20)

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- a liquid crystal display element (20) for controlling polarization of projected light projected from the reflective polarizer (30), so that the major axis direction of a pixel is arranged approximately in parallel with a direction wherein the linearly polarized light component of the projected light projected from the illumination device (51,53,54) is high;
- a screen (10AA) arranged at an upper portion of the liquid crystal display element (see Fig.32).

Applicant admitted prior art also discloses (page 5, lines 5-6) that the viewing angle is widened by the screen (10AA).

Although the Applicant admitted prior art does not expressly disclose the effect of the polarizer to adjust the transmission axis and increase the transmission rate, but that is the polarizer's function.

Gunjima discloses (col.5, lines 30-41) that the polarizing sheet provided on the light-incident side of the liquid crystal display element, such that the transmittance thereof is maximized with respect to the **p** polarized light component which is emitted from the polarized light separator.

Gunjima also discloses (col.3, lines 11-15 and col.2, lines 27-31) that the **s** polarized light component is reflected and is reused.

Therefore, the transmission axis of polarized light is adjusted and the transmission rate of the projected light from the illumination device is increased.

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Gunjima also indicates (col.5, lines 36-41) that an average direction of an optical axis of polarization of a light ray emitted from the flat light guide in the flat illumination device approximately agrees with the optical axis of polarization of the polarizing sheet on the light-incident side of the liquid crystal display element, i.e., the polarized light transmission axis of the reflective polarizer is approximately in parallel with a major axis direction of pixel of the liquid crystal display element (because the **p** polarized light is transmitted), so as to obtain a maximized transmittance.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such reflective polarizer as claimed in claims 1, 13 and 20 for achieving maximum light transmittance and widen the viewing angle.

Claims 2-3, Gunjima discloses (col.5, lines 30-41) that the polarizing sheet provided on the light-incident side of the liquid crystal display element, such that the transmittance thereof is maximized with respect to the **p** polarized light component which is emitted from the polarized light separator.

Gunjima also discloses (col.3, lines 11-15 and col.2, lines 27-31) that the **s** polarized light component is reflected and is reused.

Gunjima also indicates (col.5, lines 36-41) that an average direction of an optical axis of polarization of a light ray emitted from the flat light guide in the flat illumination device approximately agrees with the optical axis of polarization of the polarizing sheet on the light-incident side of the liquid crystal display element, i.e., the polarized light transmission axis of the

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reflective polarizer is approximately in parallel with a major axis direction of pixel of the liquid crystal display element (because the **p** polarized light is transmitted), so as to obtain a maximized transmittance.

Concerning claim 3, the optical axis of the **s** polarized light component is perpendicular to the optical axis of the **p** polarized light component, and the minor axis direction of the pixel also is perpendicular to the major axis direction of the pixel, so that the polarizer having the directivity of the light in a minor axis direction of the pixel.

Applicant admitted prior art also discloses (page 5, lines 5-6) that the viewing angle is widened by the screen (10AA).

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such polarizer and screen as claimed in claims 2-3 for achieving maximized transmittance and widen the viewing angle.

Claims 4, 23, 27 and 31, Applicant admitted prior art discloses (Fig. 36) that the reflective polarizer (30) in which the polarized light transmission axis (31) is arranged approximately perpendicularly to the optical axis (41) of the light control element (40).

Claim 5, Applicant admitted prior art discloses (page 4, lines 23-25 and Fig.32) that a screen (10AA) has transparent portions in the shape of quadrangular pyramid at the displaying plane side and black absorbing bodies covering the intervals therebetween, i.e., a screen composed to absorb external light (because the black absorbing bodies) and to transmit projected light from the illumination device (because the transparent portions).

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Claims 6 and 14, Applicant admitted prior art discloses (page 6, lines 10-20 and Fig.35) that in the light control element (40), generally, PET (polyethylene terephthalate) film having a birefringence material is used. So that the PET film is a birefringent medium, and that is arranged between the illumination device (51,53,54) and the light control element (40).

Claims 7, 18 and 22, Applicant admitted prior art discloses (page 4, lines 18-22) that the liquid crystal layer (13) is interposed between two transparent substrates (11A, 11B) and two polarizers are arranged on either side thereof.

Gunjima discloses (col.17, lines 36-67 and Fig.1) that a liquid crystal display element using a pair of absorbing type organic polarizing plates (9 and 10), so as to increase the contrast ratio.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a pair of absorption type polarizers as claimed in claims 7, 18 and 22 for increasing the contrast ratio.

Claims 10 and 17, normally, the reflective color selective layer corresponding to the pixel of the liquid crystal element as shown in the Applicant admitted prior art Fig. 37 to display the color image.

Claims 24, 28 and 32, Applicant admitted prior art discloses (Fig.35) that the light control element (40) is the only light control element arranged between the illumination device (51,53,54) and the reflective polarizer (30).

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7. Claims 8, 15 and 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art and Gunjima as applied to claims 1-7, 10, 13-14, 17-18, 20,22-24, 27-28 and 31-32 above, and further in view of US 6,147,725 (Yuuki et al).

Claims 8, 15 and 21, Yuuki discloses (col.2, lines 19-54 and Fig.13) that a illumination device comprises:

- a flat waveguide (light guide 206) having a front plane and a rear plane, the front plane constituting a light projecting plane, the rear plane with a plurality of sawtoothed diffused reflection parts (208a-208d) having declined planes (depressed or protruded);
- a light source (lamp 201) arranged adjacently to the waveguide (206);
- a reflector (reflecting sheet 207) arranged at the rear plane of the waveguide and contacting the rear plane of the waveguide (206) (or the illumination device).
- the projected light from the light source (201) is propagated in the waveguide (206) and projected from the light projecting plane of the waveguide (206).

Although Yuuki does not expressly disclose the declined plane of the reflector are manufactured to be mirrors, but using mirror plane for reflecting light was common and known in the art.

Yuuki also indicate (col.2, lines 50-54) that this reflection light is repeatedly carried out in the light guide plate (206), whereby the amount of light passing the polarizing separating film (205) is increased, thereby decreasing loss of the lamp light.

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Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such illumination device as claimed in claims 8, 15 and 21 for increasing the amount of light passing the polarizer and decreasing the light leakage.

8. Claims 9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art and Gunjima as applied to claims 1-7, 10, 13-14, 17-18, 20, 22-24, 27-28 and 31-32 above, and further in view of US 6,101,32 (Wortman et al).

Claims 9 and 16, Wortman discloses (col.9, lines 24-67; col.13, line 59-col.14, line 2) that for isotropic materials, the reflectivity varies as a function of angle of incidence, i.e., the light would be controlled by using the isotropic medium. This principle describing the behavior of uniaxially birefringent system can be applied to create multilayer stacks having the desired optical effect for a wide variety of circumstances and applications. Therefore, it would have been obvious to those skill in the art at time the invention was made to use isotropic medium or uniaxial birefringent medium as the light control element as claimed in claims 9 and 16 for achieving the desired optical effect in various applications.

Allowable Subject Matter

9. Claims 11 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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The prior art of record neither teaches nor discloses a liquid crystal display device comprises various elements as claimed, more specifically, as the following:

an angle range θ_1 wherein the brightness becomes $\frac{1}{2}$ of the peak value from the illumination device satisfies: $\theta_1 \leq \sin^{-1}(n \sin(\tan^{-1}(2d/t)))$ wherein t is thickness of substrate, n is refractive index of substrate, d is length of minor side of the pixel [claims 11 and 19].

The closest references Applicant admitted prior art and the US 5,587,816(Gunjima et al) disclose that a LCD device using illumination device and polarized light separating sheet between a light guide and the display in which reusing the light to increase the brightness, but it does not disclose the specific relation of the angle range with the refractive index of substrate, the substrate thickness and the length of the minor side of the pixel.

Response to Arguments

10. Applicant's arguments filed on Apr.16, 2002 have been fully considered but they are not persuasive.

Applicant's **only** arguments are as follows:

- 1) Claims 4 and 12 are not unclear.
- 2) The references (including Applicant admitted prior art) do not disclose all of the features of the claims 1, 13 and 20.

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3) The references do not disclose the features of dependent claims 2-4, 23, 27, 31 in which the prior art Fig. 36 does not disclose a screen by virtue of their dependency from independent claims 1, 13 and 20.

4) Claims 24, 28 and 32 in which the only light control element arranged between the illumination device and the reflective polarizer does not disclose in the prior art Fig. 36.

5) Claims 25, 29 and 33 in which the ratio of a length of the pixel in the major axis direction to a length of the pixel in the minor axis direction is substantially 3:1 does not disclose in the references.

6) Claims 26, 30 and 34 in which the stripes on the reflector are substantially parallel to the major axis direction of the pixel does not disclose in the references.

Examiner's responses to Applicant's **only** arguments are as follows:

1) Claim 4 (same as claims 23, 27 and 31) , recitation "the polarized light transmission axis is arranged approximately perpendicularly to a light control axis of the light control element" is indefinite and unclear as a light control axis of the light control element in which the axis can not be a control axis.

Claim 12, the claimed language only states a list of elements are arranged, but it does not describe the specific arrangement how to achieve the effect of the widen viewing angle.

2) The references (including the Applicant admitted prior art) disclosed limitations written in the claims as the explanation above.

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Especially, Applicant admitted prior art discloses (page 5, lines 5-6) that the viewing angle is widened by the screen (10AA). Gunjima discloses (col.5, lines 30-41) that the polarizing sheet provided on the light-incident side of the liquid crystal display element, such that the transmittance thereof is maximized with respect to the **p** polarized light component which is emitted from the polarized light separator. Gunjima also discloses (col.3, lines 11-15 and col.2, lines 27-31) that the **s** polarized light component is reflected and is reused.

Therefore, the transmission axis of polarized light is adjusted and the transmission rate of the projected light from the illumination device is increased.

Gunjima also indicates (col.5, lines 36-41) that an average direction of an optical axis of polarization of a light ray emitted from the flat light guide in the flat illumination device approximately agrees with the optical axis of polarization of the polarizing sheet on the light-incident side of the liquid crystal display element, i.e., the polarized light transmission axis of the reflective polarizer is approximately in parallel with a major axis direction of pixel of the liquid crystal display element (because the **p** polarized light is transmitted), so as to obtain a maximized transmittance.

3) Applicant admitted prior art also discloses (page 5, lines 5-6) that the viewing angle is widened by the screen (10AA). Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such screen for achieving maximized transmittance and widen the viewing angle.

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4) Applicant admitted prior art discloses (Fig.35) that the light control element (40) is the only light control element arranged between the illumination device (51,53,54) and the reflective polarizer (30).

5) Claims 25, 29 and 33, concerning "a ratio of a length of the pixel in the major axis direction to a length of the pixel in the minor axis direction is substantially 3:1", it was not described in the specification and where can be found the ratio in a corresponding figures and what is the function to arrange such pixel length ratio 3:1.

6) Claims 26, 30 and 34, concerning "the stripes on the reflector are substantially parallel to a major axis direction of a pixel of the liquid crystal display element", it was not described in the specification and where can be found that the stripes on the reflector are parallel to a major axis direction of a pixel in a corresponding figures and what is the function to arrange such stripes parallel to a major axis direction of a pixel. In the specification (page 53), it describes that the stripe shaped grooves of the waveguide (53) (could be the stripes on the reflector 54) is arranged with the direction of the polarized light transmission axis of the reflective polarizer (30).

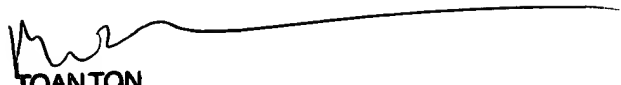
Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (703)308-6213 .

Mike Qi
April 29, 2002



TOANTON
PRIMARY EXAMINER